

# RESEARCH PROGRESS REPORT

*February 2003*

**STUDY TITLE:** Factors limiting moose at low density in Unit 19D East, and response of moose to wolf control and increased bear harvest

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## PROGRESS ON PROJECT OBJECTIVES

OBJECTIVE 1A: Estimate moose numbers and population composition in Unit 19D East.

In October 2001 we conducted aerial surveys within the eastern portion of Unit 19D and completed a census of the moose population within the Experimental Micromanagement Area (EMMA) (Table 1).

TABLE 1 Population estimates of moose in Unit 19D East and the Experimental Micromanagement Area (EMMA)

Year	Survey Area (mi <sup>2</sup> )	Population estimate	Estimate corrected for sightability <sup>a</sup>	Density estimate (moose/mi <sup>2</sup> )	Calves:100 Cows	Bulls:100 Cows
2001	Unit 19D East (5200)	1863 ± 485	2247 ± 677	0.43	29	37
2001	EMMA (520)	440 ± 0	531 ± 78	1.02	34	18

<sup>a</sup> The sightability correction factor was 1.17 (i.e. only 83% of radiocollared moose were seen).

The 2001 population estimate for Unit 19D East was higher than the 1999 and 2000 estimates but not higher than the 1996 estimate (Table 2). These previous estimates were likely low due to problems with sampling design, survey techniques, poor weather, and timing. Because of inadequate snow cover, no moose surveys were conducted during 2002 in Unit 19D.

TABLE 2 Population estimates of moose in Unit 19D, 1996–2000

Year	Survey Area (mi <sup>2</sup> )	Population estimate <sup>a</sup>	Estimate corrected for sightability	Density estimate (moose/mi <sup>2</sup> )	Calves:100 Cows	Bulls:100 Cows
1996	Unit 19D East (1819)	1924 ± 473	no	0.37	— <sup>b</sup>	— <sup>b</sup>
1999	Unit 19D East (2645)	1300 ± 202	no	0.25	— <sup>b</sup>	— <sup>b</sup>
2000	Unit 19D East (5200)	868 ± 290	no	0.17	22	35

<sup>a</sup> Extrapolated to 5,200 mi<sup>2</sup>.

<sup>b</sup> Surveys were conducted during spring, so sex ratio data is not available.

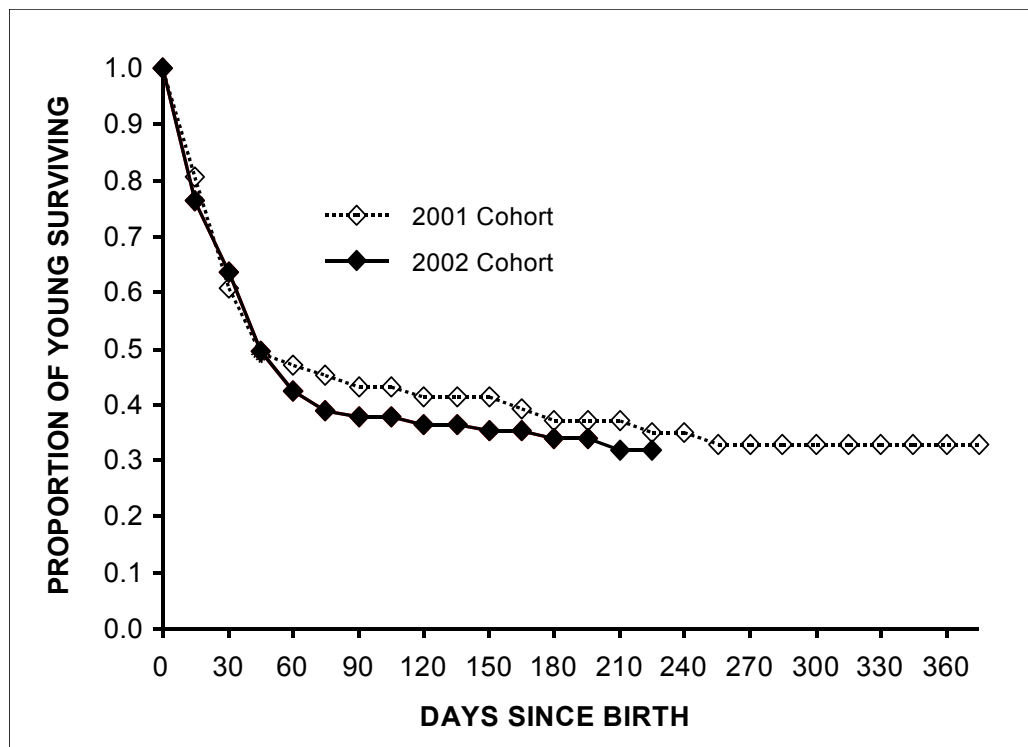


**OBJECTIVE 1B: Determine primary causes of mortality of moose calves.**

In May 2001 we captured and radiocollared 66 newborn moose calves in Unit 19D East. We monitored those calves through their first year of life and investigated causes of mortality for those individuals. During 2001 we collared calves from both the immediate vicinity of McGrath (the EMMA) and the moose calving area east of the EMMA (the Pitka Flats). We now know that moose from these areas are from separate populations, and we have since redefined the emphasis of this study to focus on moose that reside within the EMMA. Of the 66 newborn moose we captured during May 2001, 51 were calves born within or near the EMMA. Of these 51 EMMA calves, 34 died by 12 months of age (33% survival rate, Fig 1). Of these individuals 18 (53%) deaths were attributed to black bears, 9 (26%) deaths to wolves, 5 (15%) deaths to grizzly bears, 1 (3%) death to drowning, and 1 (3%) death to an unknown cause.

Of the 15 moose calves collared in 2001 in the migratory moose population east of the EMMA (Pitka Flats), none survived. Twelve of these calves were killed by grizzly bears (80%), and 3 were killed by wolves (20%).

In May 2002 we captured and radiocollared 81 newborn moose calves, and visually monitored an additional 4 calves, within and near the EMMA. Survival for these calves through December 2002 was approximately 32% (27 of 85 lived, Fig 1). We attributed 24 (41%) of the deaths to wolves, 21 (36%) deaths to black bears, 12 (21%) deaths to grizzly bears, and 1 (2%) death to an unknown cause.



**FIGURE 1** Kaplan–Meier survival functions for moose calves born within or near the Experimental Micromanagement Area (EMMA) from birth to 365 days for the 2001 cohort and birth to 225 days for the 2002 cohort



OBJECTIVE 1C: Determine condition, movements, and mortality rates of yearling and adult moose.

In March 2001 we captured 25 adult and 15 yearling moose within the study area. In March 2002 we captured 15 adult and 15 yearling moose. During processing, moose had a blood sample taken, a tooth pulled (adults only), morphometric measurements obtained, rump fat determined via ultrasound (adults only), weight taken (yearlings only), and radio collar attached. These collared individuals were then monitored to determine reproductive indices (Table 3), movements, and mortality rates. Condition indices for moose within the study area fall between, but generally closer to, the range of moose believed to be in excellent physical condition (Denali Park) than those believed to be in relatively poor physical condition (Unit 20A) (Appendix A).

TABLE 3 Reproductive indices for study animals in Unit 19D East during 2001 and 2002

Year	Observed rate of parturition (%)	Observed twinning rate (%)	10-month calf weight in kg	Average adult rumpfat depth in cm (median)
2001	70	30	179.1	0.71 (0.55)
2002	92	59	191.8	1.51 (1.58)

Monthly locations of study animals indicated that moose within the EMMA are relatively nonmigratory, and no large-scale movement pattern was evident. However, some moose that reside in the Pitka Flats (east of the EMMA) during calving season are apparently migratory, spending spring and summer in the Pitka Flats and then moving to the Farwell Burn/Alaska Range foothills in fall and winter.

Survival of collared adult females from May 2001 to May 2002 was 86% (19 of 22). With one death each being attributed to wolves, grizzly bears, and an illegal harvest. Survival of collared adult females from May 2002 to December 2002 was 97% (34 of 35). The single mortality was from illegal harvest.

Survival of collared yearling females from May 2001 to May 2002 was 83% (10 of 12). Both yearling mortalities were attributed to wolves. Survival of collared yearling females from May 2002 to December 2002 was 67% (18 of 27). The 9 mortalities from the 2002 cohort were attributed to wolves (6), legal harvest (2), and unknown cause (1).

Reproductive and survival data collected during 2001 and 2002 indicates that the moose population within the EMMA is relatively stable. Approximately 100 individuals are recruited into the population, and 100 individuals die from the population during a 1-year period from May to May (Appendix B).

OBJECTIVE 1D: Determine twinning rates and age at first reproduction of moose in Unit 19D East.

Collared adult females had an observed twinning rate of 30% during spring 2001, and 59% during spring 2002.



No data was collected for age of first reproduction to date. We will obtain age of first reproduction data as our collared yearling cohorts move through time. We will begin to collect data in spring 2003.

**OBJECTIVE 1E: Survey snow depth and density within the EMMA and adjacent areas.**

No data, in addition to that collected by the National Weather Service, was obtained on snow depth and density within the EMMA and adjacent areas during 2001 or 2002.

**OBJECTIVE 2: Characterize winter moose browse in Unit 19D East.**

Results from transect surveys of riparian willow along the Kuskokwim near McGrath, during February 2000, suggested willow stands are maturing and alder is increasing (the last major ice scouring event was in 1991). However, little browsing of alder occurred and only moderate “brooming” of willow was observed. Additional browse surveys conducted in spring 2001 at randomly selected sites had similar results. In the 2001 survey approximately 55% of willows with browsing history classified as “broomed.” Willow use in Unit 19D East is intermediate between that observed in Unit 20A where moose browse is heavily utilized and the Yukon Flats where browse is only lightly utilized (Fig 2). No data was collected on winter moose browse in the study area during 2002.

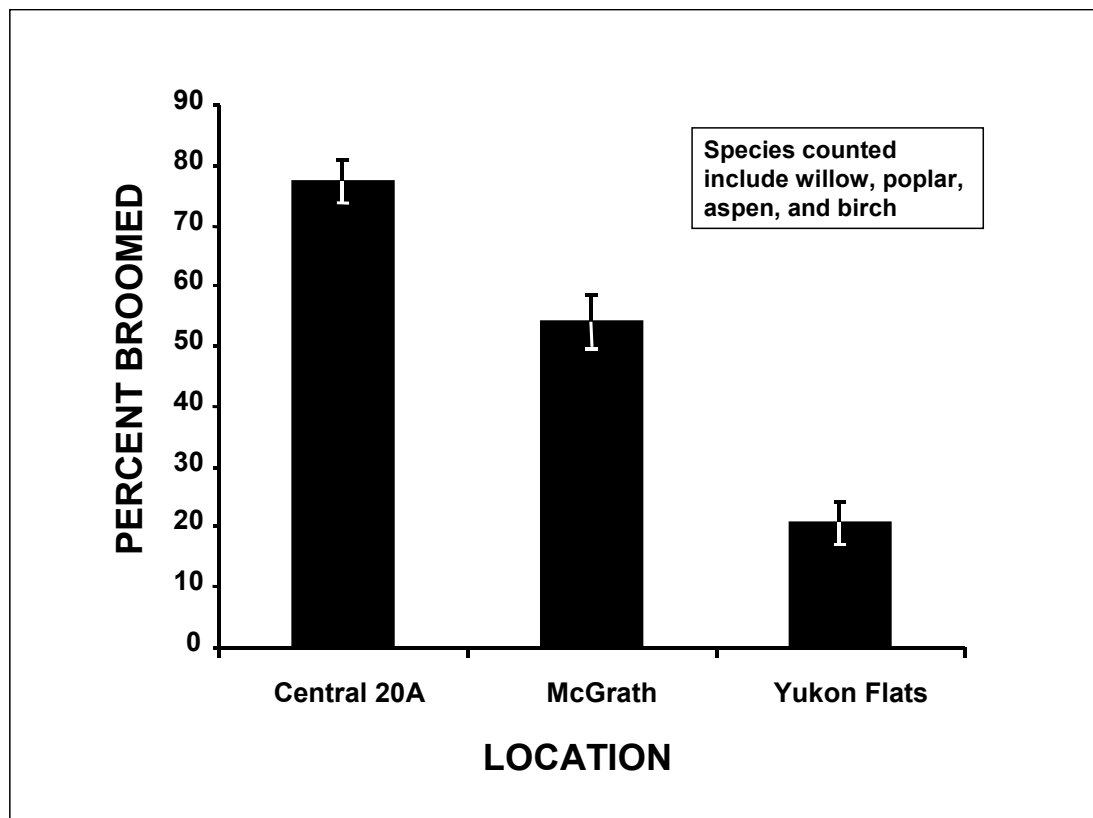


FIGURE 2 Percent of browsed forage plants that were broomed, from randomly selected plots in Unit 19D East in spring 2001



OBJECTIVE 3A: Estimate wolf numbers in Unit 19D East and identify wolf packs that hunt moose within the EMMA.

In the March 2001 survey, 103 wolves were estimated (from tracks and observations of wolves) to be present in Unit 19D East and approximately 19 wolves were harvested from the area prior to the survey. Results of this survey indicate that 33 wolves in 5 “core packs” were largely resident within the EMMA.

OBJECTIVE 3B: Determine reproductive rates and condition of wolves in Unit 19D and compare rates with other wolf populations in Alaska.

During winter 2001–2002 we purchased 25 hunter- and trapper-killed wolf carcasses from Unit 19D for necropsy. Necropsies were performed in spring 2002 and reproductive tracts were preserved for later analysis. During the current winter (Nov–Jan) we have purchased 5 wolf carcasses from Unit 19D.

OBJECTIVE 4: Document the distribution of black bear and grizzly bears numbers within and adjacent to the EMMA and characterize bear predation on moose calves.

In a collaborative project with Pennsylvania State University, we captured 20 black bears during May and June 2002 within the study area. Preliminary data (May 2002 through Dec 2002) provided by these bears indicates that movements were primarily restricted to riparian areas within the central portion of the study area in summer, followed by a general movement into the surrounding uplands in fall 2002.

During 2001 we observed 4 grizzly bears (1 sow with 2 yearling cubs, and 1 single adult bear) within the vicinity of McGrath. We did not observe any grizzly bears in 2002. These observations, kills, and other sign, indicate that grizzly bears are present within the study area, but at a much lower density than black bears.



# **APPENDIX A** Reproduction and condition indices for adult female moose from various study areas in Alaska

Study location	Moose/mi <sup>2</sup> (approximate)	Year	Observed rate of parturition (%)	Observed twinning rate (%)	Newborn calf weight in kg singleton (twin)	10-month calf weight in kg	Average adult rumpfat depth in cm (median)
Unit 19D East	1.0	2001	70	30	18.1 (16.6)	179.1	0.71 (0.55)
		2002	92	59	16.8 (15.7)	191.8	1.51 (1.58)
Central Unit 20A	2.8	1996	81	31	17.1 (13.7)		1.57 (1.2)
		1997	71	10	16.8 (14.4)	159.2	0.96 (0.9)
		1998	79	20		160.2	
		1999	79	3		168.7	
		2000	74	6		163.7	0.44 (0.28)
		2001	60	2		166.2	
		2002	76	8		179.8	
Denali Park	0.5	1998	81	53		194.0 <sup>a</sup>	2.2 (2.6)
		1999	86	29			
		2000	83	30			
		2001	62	43			
		2002					
Yukon Flats	0.3–0.5	1998	79	66	19.1 (16.8)		(1.0)
		1999	100	61			
Copper River Delta	1.7	1993					2.43 (1.6)
		1994					3.36 (2.8)
Southwest Unit 13A	2.1	1994	63	9		157.2 <sup>a</sup>	
		1995	86	13			
		1996	86	14			
		1997	87	21			
		1998	78	24			
		1999	90	18			
		2000	76	17			
		2001	69	11			1.5
Togiak	0.5	2002					
		1998	72	25			1.32 (1.3)
		1999	72	92			
		2000	96	59			
		2001	95	55			
		2002	87	75		214.6	

<sup>a</sup> Indicates multiple years pooled for one estimate.



**APPENDIX B** Conceptual model for a 1-year cycle in the Experimental Micromanagement Area (EMMA)

